Combining insect resistance with virus resistance to construct a dual system of virus control

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Control of insect pests and the viral diseases they vector is an important factor in tomato production. However use of pesticides is increasingly limited by evolution of resistant insects, regulatory changes, and increasing health and environmental concerns, and the virus resistance genes available are few in number and the control they provide can be limited.

The acylsugar mediated resistance of *Solanum pennellii* controls a broad spectrum of pests, and transfer of this system to cultivated tomato could provide an alternative method of pest control. The acylsugar tomato lines created possessing moderate levels of acylsugars strongly reduce insect presence on plants, and in some cases reduce or delay but do not prevent virus infection. Combining insect control and virus resistance could provide better control of viral diseases than either control alone. The combination of the acylsugar mediated insect resistance and virus resistance genes could also extend the useful life of the virus resistance genes. Therefore, populations segregating for both virus resistance genes and acylsugar production were used to create tomato lines possessing both traits. The virus resistance genes transferred include *Ty1* and *Ty3* (controlling *Tomato yellow leaf curl virus*, TYLCV), and *Sw5* and *Sw7* (controlling *Tomato Spotted Wilt Virus*, TSWV). These sets of genes were selected because TYLCV and SW are two very important viral diseases, and also because it provides two contrasting systems (semi-persistent transmission by *Bemisia* whitefly and persistent transmission by thrips) for testing the efficacy of combined insect/virus resistance. The development and characteristics of these lines will be discussed.